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(54) CAP TOOTH
(71) AB BOFORS WEAR PARTS
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(72) KJELL MOHLIN AND OVE NILSSON
(74) WM
(57) Claim

1. A wear part for a tool for earth-working machines, such as an excavator, loader or mechanical shovel, consisting of a front tooth tip which, in fitted condition, protrudes beyond the front edge of the tool in the working direction and which by means of a rearwardly facing female part is attached to a complementary forwardly protruding male part, which is included in an adapter attached to the tool or designed as an integral part of the front edge of the tool, the male part of the adapter and the female part of the tooth tip having support surfaces facing in different directions adapted to contact with each other, characterized in that the male part of the adapter incorporates at least two support surfaces disposed each in its own plane at a distance from each other and facing towards the surface of the earth being worked, while the female part of the tooth tip incorporates a corresponding number of support surfaces adapted for contact against the said support surfaces of the male part and facing in the opposite direction.

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COMPLETE SPECIFICATION

(ORIGINAL)

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Related Art:

Name of Applicant: AB BOFORS WEAR PARTS

Address of Applicant: Box 700, S-691 80 Bofors, Sweden

Actual Inventor: KJELL MOHLIN and OVE NILSSON

Address for Service: EDWD. WATERS & SONS,
50 QUEEN STREET, MELBOURNE, AUSTRALIA, 3000.

Complete Specification for the invention entitled:

CAP TOOTH

The following statement is a full description of this invention, including the best method of performing it known to the applicant.

Applicant: AB BOMORS, BOMORS, SWEDEN

Cap tooth

This invention relates to an improved type of easily exchangeable teeth, so-called wear parts for tools for earth-working machines such as excavators, loaders, mechanical shovels, etc. More specifically, the invention relates to a special design of so-called cap teeth. The object of the invention is to prevent the teeth concerned from loosening and falling off from their adapters when they have become worn out. This is in fact frequently a major problem, especially when the machines are used to load directly down into crushers, where a loosened tooth accompanying the crushing material can result in major damage to the crusher. Another problem is that a loosened tooth that is not directly observed by the machine operator can rapidly lead to ruining of the tooth adapter through continued working with the tool without the lost tooth having previously being replaced.

The invention relates as mentioned above to cap teeth. In teeth of this kind, the replaceable tooth tip is designed with a female part or recess extending rearwards in the working direction of the tool which is hooked over and attached by means of a locking element to a male part protruding forwards in the working direction of the tool or to a pin which constitutes the front part of the tooth adapter in the working direction and which otherwise may in turn be attached to the tool by means of its own locking member or comprise an integrated portion of the leading edge of the tool. Cap teeth are highly economical in terms of material consumption since they can be worn down until only very little material remains. The tooth should nevertheless be replaced before the bottom of the female part has been

completely worn away, since the tooth tip then normally loses its grip on the male part and falls off. The object of the present invention is now to prevent even completely worn out teeth without a bottom from dropping off from their attachments.

According to the invention it shall not only be possible to completely wear down the bottom of the female part of the tooth tip without the tooth tip falling off but the machine operator shall also be given advance warning about what is happening in that the tooth tip starts to play on the adapter, something that any competent machine operator cannot fail to observe when working with his machine. The alternative would be to inspect tooth wear several times a day, something that not all machine operators can take time to do.

According to the invention, the male part of each adapter is provided with at least two support surfaces disposed each in its own plane at a distance from each other facing towards the worked earth surface, while the female part of the respective tooth tip is provided with a corresponding number of support surfaces for contact against the said support surfaces in the male part and which thus face away from the worked earth surface.

One of the support surfaces of the male part facing towards the worked earth surface consists appropriately of the bottom surface of the male part, whereas other support surfaces facing in the same direction may consist of a support surface disposed farthest along on the male part which is located at a somewhat greater distance from the said earth surface. It is also feasible to impart the male part a T-shaped cross section with calluses protruding towards the side, where the bottom of the male part comprises one of the actual support surfaces while the others of these support surfaces comprise the underside of the respective calluses.

The female part of the tooth tip or cap is thus adapted so that it corresponds to counterdirected support surfaces. If the bottom of the tooth tip, i.e. the cap, is completely worn away, the support surface of the tooth tip resting against the underside of the male part will thus be entirely eliminated. The other support surface or surfaces which are facing in the same direction will then keep the tooth in place.

In order to call the attention of the machine operator to this fact the interacting support surfaces in the male part and female part located closest to the worked earth surface can be elaborated with the least possible play between them, whereas a sufficiently large amount of play is purposely made between the remaining interacting support surfaces in order for the tooth tip, when its bottom has been completely worn away, to rattle thoroughly on its adapter without loosening and dropping off on that account.

The invention has been defined in the accompanying claims and will now be described in greater detail and with reference to the accompanying figures, of which Fig. 1 shows a partly sectioned longitudinal projection of a tooth according to the invention, Fig. 2 shows a partly sectioned perpendicular view of Fig. 1, Fig. 3 shows the same projection as Fig. 1 but with the tooth tip in a severely worn stage, Fig. 4 shows a partly sectioned longitudinal view of another variant of the invention, while Fig. 5 shows a partly sectioned perpendicular view of Fig. 4 and Fig. 6 shows section VI-VI in Fig. 4.

Shown in Fig. 1-3 is a tooth adapter 1 which is welded to the front bottom edge 2 of a bucket. The tooth adapter 1 displays a male part 3 protruding forwards in the working direction of the bucket. On the top of the male part is a locking groove 4 in which a locking element 5 is disposed. The locking element 5 can be elaborated in several different per se known manners. Its main function is to keep the tooth tip 6 secured to the adapter 1. In order to make the figures as simple and distinct as possible, no details of the locking element have been included in the figures.

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The male part 3 of the adapter 2 narrows off forwards in the working direction of the bucket and displays a lower bottom surface 8 which, when the bucket is at work, faces towards the earth surface being worked. The male part also has an upper surface 7 and tooth side surfaces 9 and 10. The previously mentioned locking groove 4 is disposed in the upper surface 7.

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10 The tooth tip 6 is in the shape of a cap which is passed over the male part 3. For this reason, the tooth tip 6 is designed with a female part or recess 11 expanding rearwards in the working direction. This female part 11 displays a first support or bottom surface 12 adapted for contact against the bottom surface 8 of the male part, a second support or upper surface 13 for contact against the upper surface 7 of the male part, and additional supports or side surfaces 14 and 15 for contact against the side surfaces 9 and 10 respectively of the male part. In addition, the tooth tip has two rearwards protruding overhangs 16, 17, for which grooves 18, 19 are provided in the adapter. In front of the overhang is a locking groove 20 as a complement to the locking groove 4 in the male part 3. The locking element 5 fills out the space between these two locking grooves and thus locks the tooth tip 6 to the adapter 1. Two openings 21 and 22 adapted to the locking grooves and through which the locking element 5 can be removed or fitted are provided in the tooth tip.

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30 The male part 3 is terminated in the forward direction by a callus or nose 23 which displays a lower support surface 24 facing towards the earth surface being worked and which is situated farther away from the earth surface than the bottom surface 8. As evident from the figures, the female part is also adapted to the nose 23 by means of a bottom surface 25 facing towards the support surface of the latter. As evident from Fig. 1, there is normally a clearance between the bottom surface 25 of the nose 23 and the second (upper) bottom surface 24 of the male part. If the tooth tip 6 is completely worn down so that the bottom

surface 12 of the female part is entirely eliminated the stage shown in Fig. 3 is reached. The two support surfaces 24 and 25 will then interact and prevent the tooth tip 6 from falling off which would otherwise occur. The play a nevertheless causes the tooth to rattle so much in its attachment that the attention of the machine operator is called to the necessity of changing the tooth tip. In Fig. 3, the original shape of the tooth tip is marked with broken lines. In addition the possibilities of the remaining tooth tip to play on the adapter are marked with both fully drawn and dotted lines.

The variant of the invention shown in Figs 4-6 agrees in essentials with the variant illustrated in Fig. 1-3, apart from the fact that the nose 23 of the male part has been replaced by two calluses 26 and 27 disposed on either side of the male part 29 of the adapter 28. The calluses 26 and 27 each reveal a support surface 30 and 31 respectively facing towards the earth surface being worked which is located further away from the earth surface and the bottom surface 32 of the male part 29. The calluses 26 and 27 impart to the male part a T-shaped cross-section (see Fig. 5). The female part 34 of the tooth tip 33 has the same T-shaped cross-section with a main bottom surface 35 designed for contact against the main bottom surface 32 of the male part, and grooves 36 and 37 in which are disposed support surfaces 38 and 39 for contact against the support surfaces 30 and 31 on the calluses of the male part. In addition, the male part has two side surfaces 40, 41 for guidance of the tooth tip laterally through contact against the side surfaces 42 and 43 respectively of the male part.

Other details shown in Fig. 4-6 such as the overhangs 16 and 17, grooves 18, 19 adapted thereto, the upper sides 7 and 13 of the male and female parts respectively, and the locking element 5 and associated locking grooves etc. have the same reference numerals as in Fig. 1-3, since these items are identical.

5 The contact between the main bottom surfaces 35 and 32 in the male and female parts respectively should be free of play, as should the contact between the upper side 7 of the male part and the opposing contact surface 13 of the female part, as well as the side surfaces 40, 41 and 42, 43 respectively.

0 In contrast, a certain minor amount of play may be appropriate between the support surfaces 30, 38 and 31, 39 respectively. This implies that when it is worn out the tooth tip 33 will play on the adapter 28 without being able to fall out on that account. (Compare the distance a in Fig. 1.) The extra support surfaces are appropriately located within areas with small bending stresses, e.g. in the proximity of the middle plane of the tooth so that stress concentrations in tooth tip and adapter are avoided. 15
Inclinations of the extra support surfaces made necessary for reasons of manufacturing techniques must obviously be accepted as long as the inclination is not excessive.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A wear part for a tool for earth-working machines, such as an excavator, loader or mechanical shovel, consisting of a front tooth tip which, in fitted condition, protrudes beyond the front edge of the tool in the working direction and which by means of a rearwardly facing female part is attached to a complementary forwardly protruding male part, which is included in an adapter attached to the tool or designed as an integral part of the front edge of the tool, the male part of the adapter and the female part of the tooth tip having support surfaces facing in different directions adapted to contact with each other, characterized in that the male part of the adapter incorporates at least two support surfaces disposed each in its own plane at a distance from each other and facing towards the surface of the earth being worked, while the female part of the tooth tip incorporates a corresponding number of support surfaces adapted for contact against the said support surfaces of the male part and facing in the opposite direction.
2. A wear part as claimed in Claim 1, characterized in that the support surfaces of the male part facing towards the surface of the earth being worked which are located closest to the surface of the earth consist of the bottom surface of the male part, whereas a second support surface is elaborated in a nose protruding beyond the said bottom surface.
3. A wear part as claimed in Claim 1, characterized in that the portion of the support surfaces of the male part facing towards the worked surface of the earth located closest to the earth surface consists of the bottom surface of the male part while the male part in addition, at a greater distance from the surface of the worked earth, incorporates two calluses largely parallel with the said bottom surface, the bottom surfaces of which facing towards the earth surface form a further two support surfaces, one on either side of the male part, which imparts to this a T-shaped cross-section and in which the female part of the tooth tip has been imparted an appropriately adapted

cross-section with two support surfaces facing towards the bottom surfaces of the calluses.

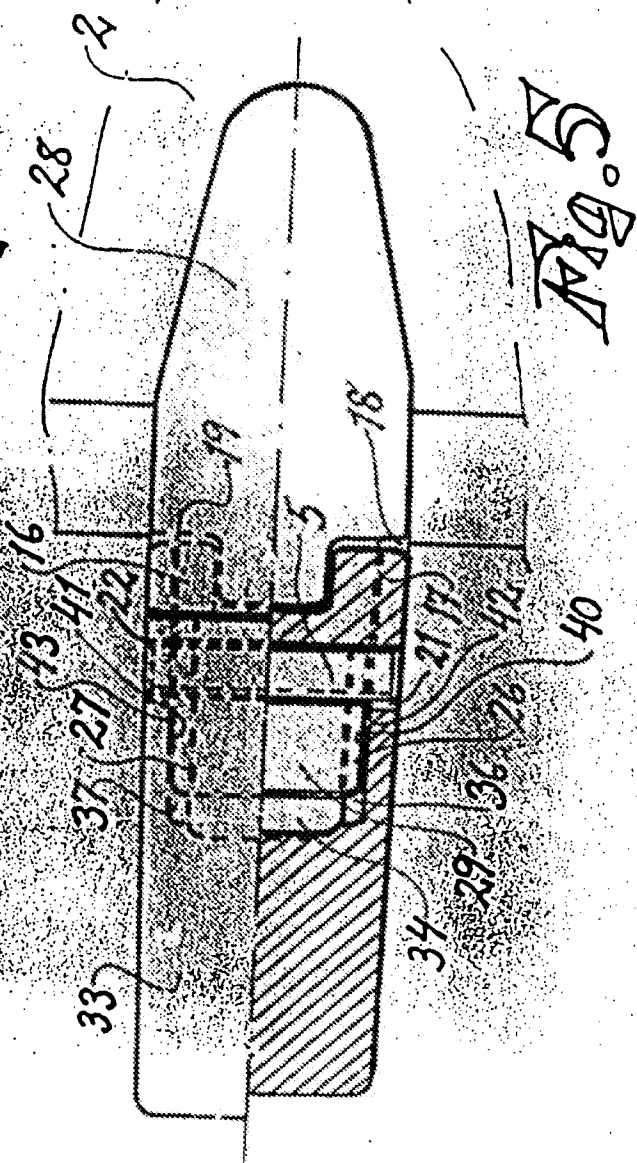
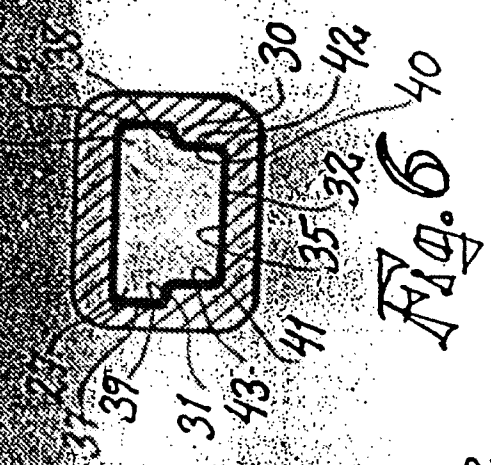
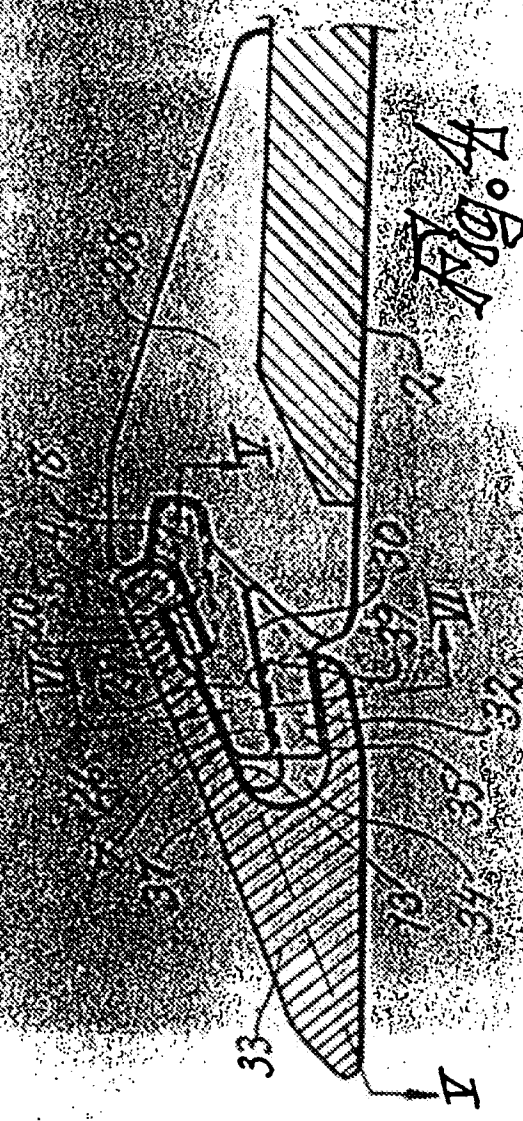
A wear part as claimed in any of the preceding claims, characterized in that the contact between the one of the support surfaces of the male part located closest to the surface of the worked earth and the corresponding support surface of the female part is virtually free of play, whereas a certain amount of play is provided between the other support surfaces of the male part facing in the same direction and corresponding support surfaces in the female part.

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AB BOFORS WEAR PARTS

EDMD. WATERS & SONS
PATENT ATTORNEYS
50 QUEEN STREET
MELBOURNE, VIC 3000.

U.S. Pat. 4,120,440



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